

KINNICUTT (F. P.)

TRANSIENT ALBUMINURIA, AS IT OCCURS,
PARTICULARLY IN CHILDREN AND ADO-
LESCENTS, IN APPARENT HEALTH

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TRANSIENT ALBUMINURIA, AS IT OCCURS,
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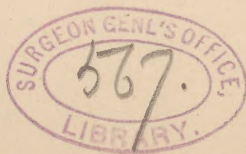
THE occurrence of a transient albuminuria in persons in apparent health, and particularly in children and adolescents, is a subject which has attracted the attention of numerous clinical observers and pathologists during the past few years, and is certainly one of much practical importance. Cases have been reported by the English physicians Sir William Gull, Drs. George Johnson, Moxon, Saundby, Dukes, and T. Morley Rooke, and by Leube, Fuerbringer, Edlefsen, and Ultzmann among other German observers.

Before further reference to and analysis of their observations and a number of my own, I shall briefly review the various theories which have been advanced in explanation of the conditions which govern this form of albuminuria. Accepting Nussbaum's¹ conclusions, based upon experimental research, that the site of transudation of albumen in the

* Read before the New York Academy of Medicine, Dec. 15, 1881.

¹ Nussbaum, M.: Fortgesetzte Untersuchungen über die Secretion der Niere; *Pflüger's Arch. f. d. gesammte Physiologie der Menschen und der Thiere*, 1878, xvii, 581. Ueber die Entstehung der Albuminurie; *Deutsche Arch. f. Klin. Med.*, 1879, xxiv, 248.

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kidney is in the glomerular vessels, Runeberg¹ maintains, as the result of numerous experiments by himself, that the filtration of albumen is dependent upon an increased permeability of the walls of these vessels, due to a condition of diminished or low blood pressure. The filtration membranes used by Runeberg in his experiments were dogs' sheeps' and rabbits' intestines, suitably prepared. Heidenhain asserts that Runeberg's conclusions are untenable in view of the demonstrable faultiness of his experiments. He shows by an analysis of his results, "that while the percentage of albumen in the filtrate diminishes by increased pressure, the absolute quantity of albumen is actually increased. With increased pressure both more albumen and more water are filtered, but the albumen stream increases more slowly than the water stream, so that the percentage of albumen in the filtrate relatively decreases with heightened pressure."²

He also shows that the membranes used by Runeberg differ in their filtration properties from the glomerular membranes, and that in other respects there is an essential difference between "the physical experiment and the physiological process."

Wittich has advanced the theory that the urine which passes through the glomerular capillaries constantly contains albumen, but that this albumen serves the purpose of nourishing the epithelium of the urinary tubules, and that the residue passes back into the circulation. In a diseased condition of the epithelium, or in its removal from any cause, albuminuria would occur. An objection which has been urged against this hypothesis, is that it assumes a different mode of nourishment of the renal epithelium from

¹ Runeberg, J. W.: Die Filtration von Eiweisslösungen durch thierische Membranen; *Arch. f. Heilk.*, 1877, xviii, 1. Albuminurie bei gesunden Nieren; *Arch. f. Path. Anat.*, 1880, lxxx, 175.

² Heidenhain, R.: Hermann's "Handbuch der Physiologie," 1880, Bd. v, 367.

all other epithelium, while it fails to satisfactorily explain the transient albuminuria following an epileptic attack, occasionally cold bathing, and occurring in the cases recorded in the present paper. Rosner, moreover, has adduced an experimental objection to this theory. By placing fresh bits of kidney in boiling water, he was able to fix the albumen in the situation in which it was produced. In diseased kidneys coagulated albumen was found in the urinary tubules, but never in healthy organs. Another explanation, which has been suggested, is that the epithelial covering of the smallest capillaries prevents the transudation of albumen; denuded of their epithelium, albumen escapes.

The experiments of Stokvis and others would seem¹ to demonstrate the incorrectness of the theory that the filtration of albumen is dependent solely upon a condition of increased or high pressure in the glomerular vessels. Stokvis has shown that when the pressure is increased in the renal arteries either by ligating the aorta below their origin, or through the extirpation of one kidney, albuminuria does not occur until the degree of pressure is such as to rupture the vessels and permit of the admixture of blood with the urine. The clinical observations that in the case of the small kidney, which is so constantly associated with high arterial tension, albuminuria as a rule occurs only occasionally and to a limited degree²; and, again, that in those forms of heart disease attended with obstructed venous circulation, albumen does not appear in the urine until the general arterial tension, and, consequently, that in the glomerular vessels, is lowered, through failure in the heart's action, while remedies which directly

¹ "Cyclopædia of the Practice of Medicine," Ziemssen, Supplement, 1881, p. 661.

² Mahomed's explanation of the diminished filtration of albumen in this condition, on the ground of a maintenance of balance between thickness of vessel walls and arterial pressure (*Lancet*, vol. i, p. 76, 1879), I cannot accept without reservation, in view of some personal observations, which I hope, at another time, to report.

tend to increase its force diminish or arrest the albuminuria, are in accord with the physiological experiment.

Other theories to which the transudation of albumen have been referred are a retardation of the blood current in the renal vessels¹ (Heidenhain and others), and Leube's hypothesis² of an individual permeability of membrane. It was shown in the experiments of Heidenhain and Runeberg (*l. c.*) that the filtration of albumen through animal membranes goes on very slowly; in other words, that it is an essential condition of such filtration, that the albumen should remain a comparatively long time in contact with the vessel wall. A vaso-motor disturbance within the kidney (either a paralysis of the vaso-constrictors or an irritation of the vaso-dilators), by producing a dilatation of the vessels, would fulfil this condition, viz., a retardation of the blood current. That this condition should alter the nutrition of the glomerular epithelium, and, when temporary, should produce a transient disturbance of the functions of the latter, is readily conceivable. It has seemed to me that the above theory, viz., a slowing of the blood current in the glomerular vessels, dependent upon a temporary vaso-motor disturbance, with a resulting alteration (also temporary) in the functions of the glomerular epithelium, may be regarded as the most probable explanation of the mode of production of transient albuminuria in persons presumably healthy. It remains for us to seek for the cause of such a vaso-motor disturbance. Inasmuch as my observations have been confined chiefly to children and adolescents, in whom, from the time of life, apparent health, and disappearance of the albuminuria (in the cases recorded), structural disease of the kidney may reasonably be excluded, I shall not venture to extend my conclusions to a later period in life.

¹ *Loc. cit.*

² Leube, W.: Ueber die Ausscheidung von Eiweiss im Harn des gesunden Menschen; *Virchow's Archiv*, 1878, lxxii, 145.

From a careful analysis of cases recorded by other observers and a study of my own, I have been led to believe that the source of irritation, in a large number of instances, is to be found in the temporary presence of imperfectly oxidized nitrogenous matters in the renal circulation; in other words, to a transient oxaluria or lithuria, which, clinically, may be regarded as identical. The marked derangements of the nervous system in more or less chronic lithæmia in adults are well recognized; many of the symptoms which Dr. Da Costa¹ has recently made the subject of a very interesting monograph indicate the degree to which the vaso-motor system is affected. In children, the general nervous symptoms attending the lithæmic state are equally pronounced, though hitherto not as well recognized. To this fact my attention was first drawn by Dr. Wm. H. Draper, and my experience since has fully corroborated it. That the nervous symptoms are directly dependent upon the presence in the blood of the irritating products of imperfect oxidation of nitrogenous matter can hardly be doubted, although different views may be held as to the system which is primarily concerned in the production of this state.

With these facts before us we may reasonably believe that a more or less transient oxaluria or lithuria may be capable of producing a correspondingly temporary irritation of the nervous system. A transient general nervous disturbance, in which the vaso-motor system would necessarily share, may be supposed, or one confined to the vaso-motor system of the kidney in its excretion of a large amount of irritating matter, and resulting in a temporary albuminuria.

A similar albuminuria which follows an epileptic attack, may presumably be referred to the disturbance which affects the general nervous system, and consequently, the vaso-motor system of the kidney.

¹ Da Costa, *American Journal of the Med. Sciences*, Oct., 1881.

Again, in the temporary albuminuria which has been observed in cases of exophthalmic goitre,¹ we have a probable instance of retarded blood current in the renal vessels, the result of dilatation dependent upon the affection of the general vaso-motor system.

The apparently more frequent occurrence of temporary albuminuria, without structural change in the kidney, in children and adolescents, than at a later period, I would explain on the ground of the greater mobility of the nervous system which obtains at these periods of life.

Its occurrence in only a comparatively small proportion of cases of lithæmia at these ages may be referred to an *individual* mobility of the nervous system in such cases. (In another group, the skin or the mucous membranes may be the most vulnerable portions of the organism.) In my own experience, a transient albuminuria in connection with the lithæmic state has been observed, as a rule, in children and youths of nervous temperament; in the latter instance, in active brain-workers, frequently during periods of unusual mental worry or strain; under conditions where the general nervous tone was below par. (In this connection a simple reference to the clinical fact of the influence of profound mental emotion in temporarily increasing the albuminuria in chronic Bright's disease is suggestive.) Leube's hypothesis of an individual permeability of membrane (*l. c.*) may also be considered as a possible etiological factor in these cases.

In illustration of the subject which we have been considering, I shall now briefly review the cases of transient albuminuria which have been recorded by various observers.

In a discussion before the Royal Medical and Chirurgical Society of London in 1873, on albuminuria,² Sir William Gull mentioned that in his experience "it occurred in

¹ Dr. Begbie, *Edinburgh Med. Journal*, April, 1874. ² *Lancet*, 1873, i, 808.

young and growing men and boys, almost as frequently as spermatorrhœa," and that it might presumably be referred to an atony of vessels and nerves. In a paper by Dr. Moxon ("Guy's Hospital Reports," 1878) 19 cases of intermittent albuminuria occurring in adolescents in apparent health are reported. The symptoms presented by the patients were of an indefinite character, consisting in listlessness, languor, occasional headache, unrefreshing sleep, with little disposition for cheerful company. In the majority of cases no complaint was made by the patients, but advice was sought through the anxiety of friends. Dr. Moxon says: "I have not met with this set of conditions at other periods of life, and I have so frequently met with them in adolescents, that I cannot but believe that it is a disordered state proper to that term of life, and that it is deserving of recognition and receiving a name." He further mentions that careful examination, in his cases, of the various organs of the body gave negative results, and that, moreover, he was able to exclude scarlatina and diphtheria, which might leave a sequel of albuminuria and lead to fallacy. Many of the cases were kept under observation for several years, the urine being repeatedly examined, with the result of finding that the albuminuria had wholly disappeared, and that excellent health was maintained.

In the history of the various cases, whenever the result of the examination of the urine, aside from the existence of albumen, is recorded, the presence of a large amount of oxalate of lime, or a combination of uric acid and oxalate of lime, is mentioned. Their presence, and in large quantity, was so commonly observed as to attract Dr. Moxon's attention. He does not, however, express any positive opinion as to their causal relation to the albuminuria. It may be mentioned that small oxalate of lime calculi were subsequently passed by one of his patients.

In the *British Medical Journal* of Nov. 10, 1878, ten cases of intermittent albuminuria in adolescents from 13 to 17 years of age are reported by Dr. Clement Dukes. In three of the cases there is presumptive evidence of the existence of structural change in the kidney. In Case 1 the albuminuria followed an acute attack of nephritis with bloody urine, and occurred at intervals for the subsequent eight months, when the record ceases.

In Case 2 albumen was detected in the urine immediately subsequent to an attack of scarlatina, and it continued to appear from time to time up to the date of publication of Dr. Dukes' article.

Finally, in Case 10 it is stated that with pallor and a feeling of faintness on severe exertion, high arterial tension existed, and an examination of the heart revealed a heaving, hard impulse—suspicious symptoms certainly in connection with albuminuria. Inasmuch as in only three of the remaining cases had the albuminuria disappeared at the date of record, and in these for a comparatively short time, we are hardly warranted in positively assigning them to the group which we have under consideration. They certainly differ in many respects from the cases described by Dr. Moxon, and from my own. The symptoms consisted of furred tongue, headache, disinclination for work or play, irregular or constipated bowels; often there was anæmia, and occasionally a slight cold, facial dropsy, and slight syncope attacks. The microscopic examination of the urine is not given. In Dr. Dukes' opinion the albuminuria is the result of a temporary hyperæmia of the kidneys, superadded to an habitual increased arterial tension, which he claims obtains at puberty, basing this opinion upon Beneke's researches. Mahomed, on the contrary, asserts that the result of his personal experience is to the effect that a condition of low tension exists at this period of life.¹

¹ *Lancet*, 1879, vol. i, p. 76.

In an article in the *British Medical Journal* of Nov. 12, 1881, Dr. Dukes reverses his former opinion, stating that as the result of further observation he is forced to regard the albuminuria of adolescents not only as pathological, but as representing the beginning of true Bright's disease. He adds, however, that he has been unable to observe his cases in its further development.

In a single case of transient albuminuria recorded by Dr. Yeo (*British Med. Journal*, Oct. 26, 1878), the presence of albumen in the urine alone being mentioned, an explanation of the symptom is sought in the hypothesis of a temporary vascular asthenia, dependent upon a possible deficiency or disturbance of nerve force of transient duration.

In an intermittent albuminuria in a young girl, disappearing during rest in bed,¹ Dr. T. Morley Rooke seeks to explain the condition on mechanical grounds. He says that "when the body is in the upright position the weight of the column of blood is too great for the weakened vessels,"—a theory which requires further demonstration.

In a very interesting paper in the *British Med. Journal* of Dec. 13, 1879, on "Latent Albuminuria, its Etiology and Pathology," Dr. George Johnson mentions the frequency with which albumen is found in the urine of persons in apparent health, and terms it "latent albuminuria." He maintains that although unassociated with any evidence of functional or structural disease, it may, by careful inquiry, be traced back, in a very large proportion of cases, to some possible exciting cause, *i. e.*, to an attack of scarlet fever or diphtheria, or a cold, etc.; moreover, "that even the smallest trace of albumen in the urine is always pathological, never physiological; and that the neglect of a pathological condition and tendency, especially such negligence

¹ *British Med. Journal*, Oct. 19, 1878.

as involves repeated exposure to the exciting cause, may convert a temporary and occasional into a persistent albuminuria, which sooner or later, though it may be after many years, will result in a fatal disintegration of the kidneys." Admitting the frequent dependence of albuminuria upon dyspepsia, he believes that the chain of events is represented by an irritation of the gland cells of the kidney in the process of excretion of ill-digested matter, through which they later undergo structural changes, while at the same time the imperfectly assimilated albuminous materials pass more readily by exosmosis through the Malpighian bodies. An additional factor is found in the general nervous exhaustion, with loss of vaso-motor force, which accompanies chronic dyspepsia, leading to a diminution of tone and contractile power in the muscular walls of the arterioles generally, including those of the kidney. Admitting, therefore, the irritating effect of the products of mal-assimilation upon the kidney, as well as a vaso-motor disturbance accompanying their presence in the blood, he believes apparently that the gland cells are primarily affected, undergoing structural change with a continuance of the irritation, rather than that such irritation may be confined to the vaso-motor system within the kidney, with resulting temporary disturbance in the nutrition and functions of the glomerular epithelium, and consequent transient albuminuria.

In an examination of the urine of 145 male patients by Dr. Saundby, taken *seriatim* as they presented themselves at the General Hospital in Birmingham, England, albumen was discovered in no less than 105¹; 67 of these cases are tabulated by Dr. Saundby under the head of chronic Bright's disease; five cases, occurring in patients between

¹Saundby, R. : The Diagnostic Value of Albuminuria ; *Brit. Med. Journ.*, 1879, i, 699.

ten and twenty years of age, are attributed to simple debility; two, at a similar period of life, to dyspepsia.¹ Of these a portion, he says, resembled Dr. Dukes' cases, a portion Dr. Moxon's.

No evidence of organic disease could be detected. The examination of the urine is not given in full, but it is stated that in a few instances oxalate of lime was present. In Dr. Saundby's opinion a temporary hyperæmia may be regarded as the source of this form of albuminuria, and he believes that it is in no respect inconsistent with an integrity of renal structure.

In a case of intermittent albuminuria, in a physician, 29 years of age, in good health, which finally disappeared after an interval of eight months, reported by Fuerbringer,² there are several points of interest. The albumen was first accidentally discovered in a morning specimen of urine, passed after an hour of great mental anxiety. The noon urine of the same day contained less, and the evening water, after the mental depression had passed away, was entirely free from albumen. During the following week occasional traces of albumen were detected. After a second period of great anxiety and depression a small quantity of dark, clear, highly acid urine was passed, of a sp. gr. 1.030, containing 31 per cent. of albumen and a large amount of uric acid. Under similar circumstances, on two subsequent occasions the same symptoms occurred. At other times, when the amount of albumen was less, uric acid, or oxalate of lime, or both, with amorphous urates, were commonly present. No effect upon the albuminuria was produced by diet. The ingestion of eggs in large number, strong spices and liquors, were followed by negative results. Severe physical exercise produced a temporary in-

¹ In one of the cases classed under the head of debility, the albuminuria followed typhoid fever.

² *Zeitschrift für Klinische Medicin*, 1880, i, p. 340.

crease in its amount. A very careful examination of the patient failed to reveal any organic disease. Fuerbringer would explain the phenomena on Runeberg's theory of diminished pressure in the glomerular vessels, produced by general arterial ischæmia, the result of profound emotional disturbance of a depressing character. The influence, however, of similar causes in exciting a temporary lithæmia is well recognized, and I would therefore suggest that profound mental depression, lithæmia, albuminuria constituted the probable sequence of events in the above case.

The following cases have come under my personal notice. Within the past few years the number of such observations has been comparatively large, but as they have all been made in private practice, the opportunities for carefully tracing the greater number of cases have been wanting. I shall, therefore, with a single exception, confine my remarks to such as I have been permitted to keep under constant observation, and where the albuminuria has now been absent for many months. In all of them careful inquiries were made in regard to previous illnesses, which might have a bearing upon the subject under consideration, with results which will be stated in the individual cases. The possible existence of affections of the bladder and urethra were carefully investigated, but they were invariably found to be absent. In this connection Simon's researches, to the effect that neither the prostatic nor seminal fluids contain any bodies which are coagulable by heat, may be mentioned. "Casts" were never found in the urine, although careful search was made for them. In none of the cases was the amount of urinary water apparently decreased, although the quantity passed in the 24 hours was not measured.

Sphygmographic tracings, which were taken whenever possible, showed either normal or slightly lowered arterial tension. In all the cases the amount of albumen in the

urine was very considerable. In all, the microscopic examination was made within *twelve* hours; in many of the cases, as soon as *two* hours after the passage of the urine.

At the period when the following case was observed my attention had not been directed either to the occurrence of transient albuminuria in health or to its association with a temporary oxaluria or lithuria. I believed it, at the time, to be one of latent Bright's disease.

CASE 1.—Mr. A., aged 23. The patient is of nervous temperament. While in New York on a visit in the winter of 1874, in apparent health, his urine was examined by me in a non-professional capacity. To my surprise and concern it was found to contain a large amount of albumen, together with much uric acid and oxalate of lime. Without mentioning the matter to Mr. A., I immediately wrote to his family physician in regard to the result of my examination. I received in reply a communication to the effect that the urine had been examined by him on Mr. A's. return home, two days later, and was found to be wholly free from albumen. His water has been very frequently examined since with a similar result, and his health has continued to be excellent.

CASE 2.—Mr. B., medical student, aged 21. Is of nervous temperament. Had scarlet fever without albuminuria during childhood. Has never had diphtheria. Has been under my observation for the past five years, during which period he has enjoyed excellent health. In February, 1881, while engaged in active brain work, taking little exercise or recreation, but eating largely, he began to complain of lassitude, weariness after exertion, either mental or physical, and slight morning headache. An examination failed to reveal any evidence of organic trouble. Examination of the urine gave the following results: React. highly acid; sp. gr. 1.030; albumen, both by heat and nitric acid. Acidulated with a few drops of acetic acid, boiled, and allowed to stand, albumen $\frac{1}{10}$. Microscopic examination showed the presence of a large amount of uric acid and oxalate of lime, but was otherwise negative. Hunyadi janos water on rising, with alkalis before meals, a regulation of the diet, and exercise in the open air were prescribed. The urine continued to contain albumen in diminished amount for the three following days, when the record of the exam-

ination is as follows : React. neutral ; sp. gr. 1,020 ; no trace of albumen obtained either by heat or nitric acid. Microscopic examination negative. There was accompanying improvement in the general symptoms. During the past ten months the urine has been repeatedly examined (last date Dec. 1, 1881), but never at any time has it contained albumen ; uric acid and oxalate have also been constantly absent.

CASE 3.—Mr. B., student, aged 17. Has never had diphtheria. Had scarlet fever five years ago, without albuminuria. The urine was repeatedly examined by me during and subsequent to his illness, and at no time contained a trace of albumen. Has always enjoyed excellent health. Is a large eater. In Oct., 1880, while in apparent perfect health, on account of a remark that there was a sediment in his water, the urine was examined. The record is as follows : React. highly acid ; sp. gr. 1030 ; albumen, both by heat and nitric acid. Acidulated, boiled, and allowed to stand, albumen $\frac{1}{2}$. Microscopic examination : A large amount of uric acid and oxalate of lime present ; otherwise negative. A saline cathartic, alkalies, regulation of diet, and out-door exercise were prescribed. An examination of the water 36 hours later showed a normal sp. gr. and acidity, an entire absence of albumen, of uric acid, and oxalate of lime. The urine has been repeatedly examined since (last date Nov. 25, 1881), but albumen has never been found ; neither has it contained uric acid or oxalate of lime. The patient's health has continued excellent.

In the above cases the marked degree of the albuminuria, its very transient nature, its constant association with uric acid and oxalate of lime are noteworthy.

CASE 4.—Mrs. D., aged 22. Patient is of nervous temperament and lithæmic diathesis. Has never had diphtheria. Had scarlet fever, without any evidence of renal trouble during childhood. Has been under my observation for several years, during which time she has enjoyed excellent health.

The usual routine examination of the water was made on several occasions during this period, in trifling ailments, but albumen was never found. Late in the past autumn my advice was sought for the relief of morning headache and general lassitude. The patient also complained of moderate constipation, flatulence after meals, and a coated tongue. There was no fever or other

evidence of more than a temporary functional disturbance of health. For several weeks previous she had been living a very luxurious life, eating heartily and taking little exercise.

An examination of the urine, an after-breakfast specimen, showed a highly acid reaction, with a sp. gr. 1030; very considerable albumen both by heat and nitric acid, and oxalate of lime in large amount. An evening specimen of the same date resembled the morning's in all respects, with the exception of possessing a higher sp. gr., viz., 1032. Advice, similar to that which has been mentioned in the previous cases, was given and adopted, with the result of speedily relieving the subjective symptoms. Examination of the urine four days later showed a diminution in the acidity, lower sp. gr., and a mere trace of albumen in the evening specimen only. Uric acid was also found in the evening water alone and in small quantity. Examination of the urine on the fifth subsequent day: react. acid; sp. gr. 1022; no trace of albumen on very careful testing with both heat and nitric acid, in either a morning or evening specimen. Microscopic examination, negative. Two weeks later the examination was repeated. The record is as follows: After-breakfast specimen, react. acid; sp. gr. 1025; albumen absent, also uric acid and oxalate of lime. Evening specimen, react. highly acid; sp. gr. 1034; albumen, both by heat and nitric acid; urates precipitated by nitric acid; acidulated, boiled, and allowed to stand, albumen $\frac{1}{12}$. Microscopic examination: very numerous oxalate of lime crystals.

The patient had discontinued her medicine, and had taken little exercise during the previous week. She had, moreover, been suffering from much mental anxiety. Greater care in diet and more vigorous out-door exercise were urged and adopted, and on the following examination, Dec. 10th, a week later, the urine was found to be entirely normal. The points of especial interest in the above case are the transient character of the albuminuria, its invariable appearance and disappearance in the presence and absence of uric acid and oxalate of lime. The patient has not been under my observation for a sufficiently long period to express a positive opinion in regard to the absence of structural kidney change, but the symptoms certainly very closely resemble those observed in the group which I have described.

CASE 5.—Ethel M., aged 4 years. Has never had diphtheria or scarlet fever. The urine was examined on account of advice being sought for incontinence of water, the patient being in excellent health at the time. It was found to be markedly acid, of

high sp. gr., to contain albumen $\frac{1}{14}$, and uric acid with oxalate of lime in large amount. Two days later the urine was free from albumen and the above salts. The patient has been under my observation up to the present date, three years from the first examination; her health has been unusually good, and in frequent examinations (last date Nov. 12, 1881) the urine has been invariably normal.

CASE 6.—Ethel W., aged 9 years. Had scarlet fever without albuminuria when 4 years old. Has never had diphtheria. The patient has a neurotic family history. In July, 1880, had a convulsive attack, which was attributed to indigestion. Subsequent attacks demonstrated their epileptic nature. Under treatment further paroxysms have not occurred. The record of an examination of the water, Oct. 8, 1880, is as follows: Evening specimen, react. acid; sp. gr. 1031; distinct amount of albumen both by heat and nitric acid. Microscopic examination: a large amount of uric acid present.

An examination of an after-breakfast specimen of the same date gave similar results, differing only in having a lower sp. gr. Examination a few days later, morning specimen: react. acid; sp. gr. 1014; free from albumen; microscopic examination, negative. Evening water, same date: react. acid; sp. gr. 1026; *trace* of albumen, with *few* uric acid crystals present. On the following examination, although the sp. gr. of the urine was 1033, it was wholly free from uric acid and oxalate of lime, and did not contain a trace of albumen.

Very frequent examinations have been made up to the present date, and the records show the invariable absence of any trace of albumen; also the absence of uric acid and oxalate of lime. It may be mentioned that the diet has been most strictly regulated during this period, and careful attention given to all other hygienic measures.

CASE 7.—Florence T., aged 4 years. The patient has a lithæmic diathesis. Has never had diphtheria or scarlet fever. During the winter of 1880 advice was sought for an attack of urticaria. The tongue was coated, the bowels disordered, and the cutaneous symptoms very pronounced. There was no fever. Examination of the urine: react. acid; sp. gr. not recorded; a considerable amount of albumen both by heat and nitric acid; urates precipitated by the addition of acid; microscopic examination, amorphous urates.

The following examinations gave entirely negative results. The

child has continued to be in excellent health up to the present date.

Urticaria is now universally ranked among the neuroses, and it is a neurosis in which the vaso-motor system is pre-eminently affected.

Moreover, a temporary lithæmic state is recognized as a frequent factor in its genesis. The above case may therefore not unreasonably be regarded as lending support to the theory of transient albuminuria occurring in apparent health, which has been suggested in this paper. I possess the notes of two other cases of temporary albuminuria in children of 4 and 5 years of age respectively, associated with transient lithæmia, but as they closely resemble the cases already narrated, their recital is unnecessary. I have at present under observation four additional cases in adolescents, but as they have only recently come under my notice, I do not feel warranted as yet in including them among the above.

Inasmuch as it has been wisely said "that much of that which each man thinks that he observes is but a part of himself," it may be mentioned that Dr. Draper kindly consented, at my request, to repeat the examination of the urine in many of the cases which I have recorded, with the result of corroborating my observations.

The presence of uric acid, either in the crystalline or amorphous form, even in large quantities, in a concentrated and highly acid urine, cannot be accepted as a demonstration of its excessive elimination from the body. Oxalate of lime, however, is present in the normal urine only in minute quantity (Schultzen¹) if at all (Neubauer²); urine, therefore, found to contain a large amount of oxalate of lime within two or three hours after its passage, may fairly

¹ *Archiv f. Anat. und Physiol.*, 1868, p. 719, *et seq.*

² "Analysis of the Urine," Neubauer and Vogel, p. 168.

be judged to indicate an excessive elimination of this imperfectly oxidized nitrogenous matter.

In my own cases the urine in several instances was examined two hours after being passed, and showed the presence of a large quantity of oxalate of lime crystals alone.

Moreover, in the majority of all the cases the constitutional symptoms were of a character usually present in lithæmic patients.

The very constant association of imperfectly oxidized nitrogenous matter in the urine and albuminuria, especially in Dr. Moxon's and my own cases, cannot reasonably, it seems to me, be regarded as a simple coincidence; in the latter observations we find an additional argument against such an hypothesis in the disappearance of the albuminuria *pari passu* with the lithæmia. Dr. Murchison¹ maintained that such an association, at a later period in life, not only was to be regarded in the light of a causal relation, but he also agreed with Dr. George Johnson in believing that "renal degeneration may be a consequence of the long-continued elimination of products of faulty digestion through the kidneys."² That temporary albuminuria in children and adolescents in apparent health is invariably dependent upon a transient oxaluria or lithuria, I do not maintain. The observations of Leube, Ultzmann, Fuerbringer,³ and others would seem to show that prolonged and vigorous physical exercise is capable of occasionally producing, though in an as yet unsatisfactorily explained manner, a slight transient albuminuria in presumably healthy persons. I have not referred to the theory of chemical or "food albuminuria" in explanation of the condition which is the subject of this paper, for the reason that careful investigations and experiments leave it extremely doubtful whether albuminuria (the presence in

¹ "Clinical Lectures on Diseases of the Liver," Amer. edition, pp. 572, 573.

² *Brit. Med. Journ.*, 1872, vol. 1, pp. 161-191.

³ *Loc. cit.*

the urine of a body coagulated by heat or precipitated by neutralization—Saundby) is ever due to the transudation of a modified or more easily diffusible form of albumen. Dr. Saundby has shown, by a series of very interesting observations and experiments,¹ that the several tests, viz., an increase of albumen after food, a greater diffusibility of such albumen (Parkes, Pavy), and a difference in the coagulation temperature (Lauder Brunton and D'Arcy Power), which have been used by different investigators in their attempt to prove this point, are not to be relied upon.

In conclusion, my observations would seem to show that temporary albuminuria, as it occurs in children and adolescents in apparent health, may be traced in a large number of instances to a transient oxaluria or lithuria, and I would suggest that the sequence of events in the causation of the albuminuria is as follows:

1. The temporary presence of a large amount of imperfectly oxidized matter in the circulation.
2. A disturbance of the general nervous system, in which the vaso-motor system of the kidney shares, or one confined to the vaso-motor system of the kidney in its elimination of these products of a faulty digestion.
3. A transient dilatation of the blood-vessels of the kidney and a retardation of the blood current in the glomerular vessels, with a consequent possible alteration in the functions of the glomerular epithelium, also of a temporary nature.

¹ *Brit. Med. Journ.*, vol. 1, 1880, p. 841; *Birmingham Med. Review*, July, 1879.

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